

November 22, 2005

TO: D. Morris
FROM: A. Andujo
SUBJECT: Spitzer Space Telescope 34 Meter Array Utilization Impact Study

The Resource Allocation Team has completed a special study to analyze the ability of the DSN to provide support for the Spitzer Space Telescope (STF).

Background

The Spitzer Space Telescope mission is investigating the usage of 34-meter arrays to provide support to the mission when 70-meter contention is too high or there is planned 70-meter downtime. This study is in response to a request to determine the feasibility of attaining array support on the 34-meter subnet as well as determine the impact to other projects/missions.

Summary of Results

A review of supports currently scheduled for STF in the mid-range schedule weeks 48 of 2005 through 15 of 2006 was conducted and it has been found that currently scheduled activities:

- Between weeks 48/2005 – 52/2005 STF support is scheduled at 70M only without conflicts
- In weeks 01/2006 – 04/2006 STF is scheduled at the 70M with 6 Arrayed supports at the 34B1 without conflicts
- In weeks 05/2006 – 15/2006 STF is scheduled at 70M only with minimal conflicts (26 of 179 passes consisting of 3 facility and 23 equipment conflicts).

In the periods of week 01/2006 through 04/2006 the STF scheduler found it necessary to utilize 34 meter arrays to support the mission due to high contention caused by the Stardust mission's Earth Return requiring continuous and near continuous support on the 70 meter subnet.

Forecast for weeks 16/2006 – 52/2006 indicates that the 70-meter support is difficult to acquire in many weeks of the year, particularly during the DSS-63 downtime where the projected supportable time is as low as 71% in some weeks. Augmenting STF support with 34 Meter Arrays passes helps to alleviate supportability issues with little or no impact to other missions and increases STF minimum supportability to 86% overall. However, the project may view the 34-Meter array support as less desirable due to a loss of telecommunications margin. (See figure 1 and 2)

Due to STF's minimal requirements and moderate viewperiod, scheduling the mission without conflicts should continue to be easier than scheduling two 70-Meter supports per day in a high contention period.

Assumptions

- DSS – 15 downtime in weeks 36 – 40 of 2006
- DSS – 16 closed in week 5 of 2006
- DSS – 45 downtime in weeks 41 – 49 of 2006
- DSS – 63 downtime for weeks 21 – 39 of 2006

Analysis

Analysis was accomplished using the JPL Tracking Integrated Ground Resource Allocation System (TIGRAS) scheduling tool, the updated mission set database from the February 2005 Resource Allocation Review Board (RARB), and currently developed schedules from the DSN Mid-Range process.

Negotiations for part of the study period under consideration are still in progress within the Mid-range process.

During analysis several factors were considered:

- DSN resources down during the requested time period

Current Key Mission Requirements

- The apogee for both the POLAR and IMAGE missions occur over the Southern hemisphere. Due to this occurrence, DSS-34 and DSS-46 are the primary DSN resources utilized by these missions in order to meet their mission requirements.
- The ACE, CLUSTER II, Geotail, and SOHO missions all utilize the 26 meter subnet in order to meet their mission requirements
- 80% of CLUSTER II's Wide-Band Data (WBD) Opportunities are in the southern hemisphere and require simultaneous tracking support from three to four apertures
- SOHO will be in their Keyhole period in:
 - Weeks 8 through 11 of 2006
 - Weeks 21 through 24 of 2006
 - Weeks 34 through 37 of 2006
 - Weeks 47 through 50 of 2006
- Stardust (SDU) Earth Re-entry Week 01 of 2006.
- New Horizon (NHPC) is scheduled to launch on January 10, 2006.
- Stereo Ahead (A) and Behind (B) launch to be scheduled in mid 2006.
- Space Technology-5 (ST-5) is scheduled to launch on February 28, 2006.

Other major events and downtimes occurring during the study period are listed in the supporting data attached at the end of this study.

Conclusion

Based on current data gathered for this study, including schedules built through Week 16/2006 and an approximation of future schedules which will be built based on the current User Loading Profiles (ULP's) for all active missions, the DSN can provide most all of the currently requested support to Spitzer Space Telescope at the 70 Meter subnet and or in combination with 34 meter Arrays.

Recommendations

Based on the study case it is recommended that STF mission planners and schedulers plan to use and request 34-meter array support during high 70-meter contention periods such as the DSS-63 downtimes in 2006 and 2007 and the proposed DSS-43 Life Extension downtime in 2008. (See Figures 3 – 5)

Supporting Data

Figure 1: STF Impact to Supportability for All Missions

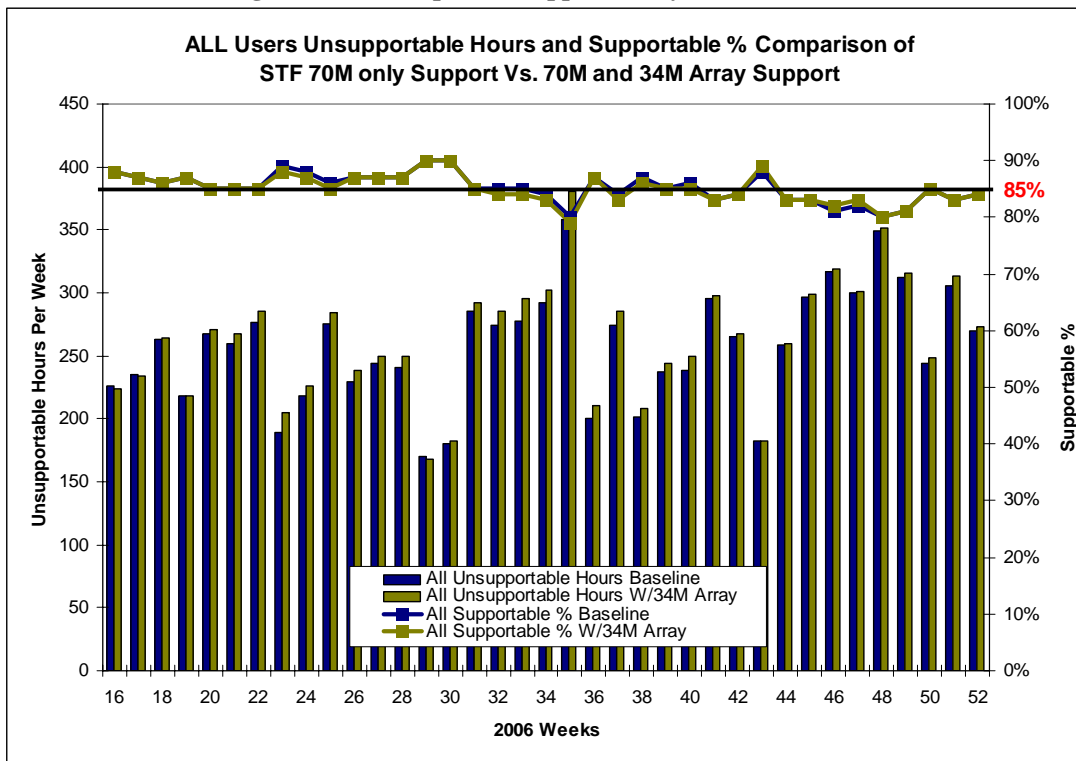


Figure 2: STF Supportability Comparison with and Without Array

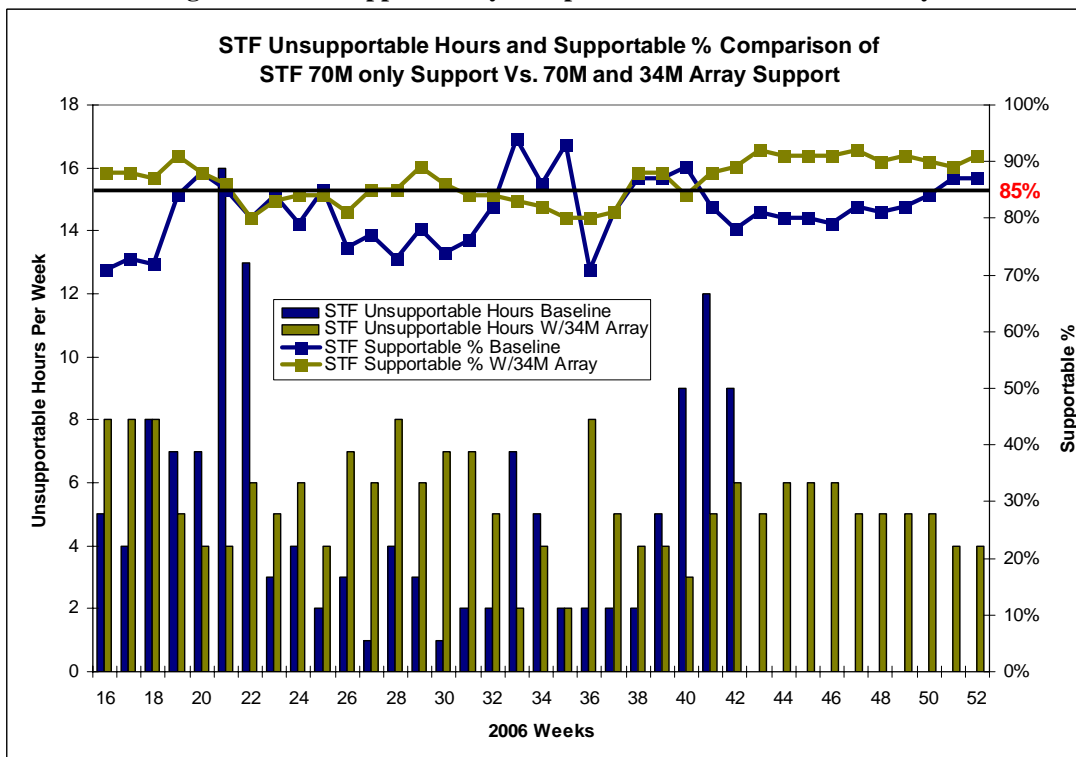


Figure 3: DSN Major Events and downtimes for 2006

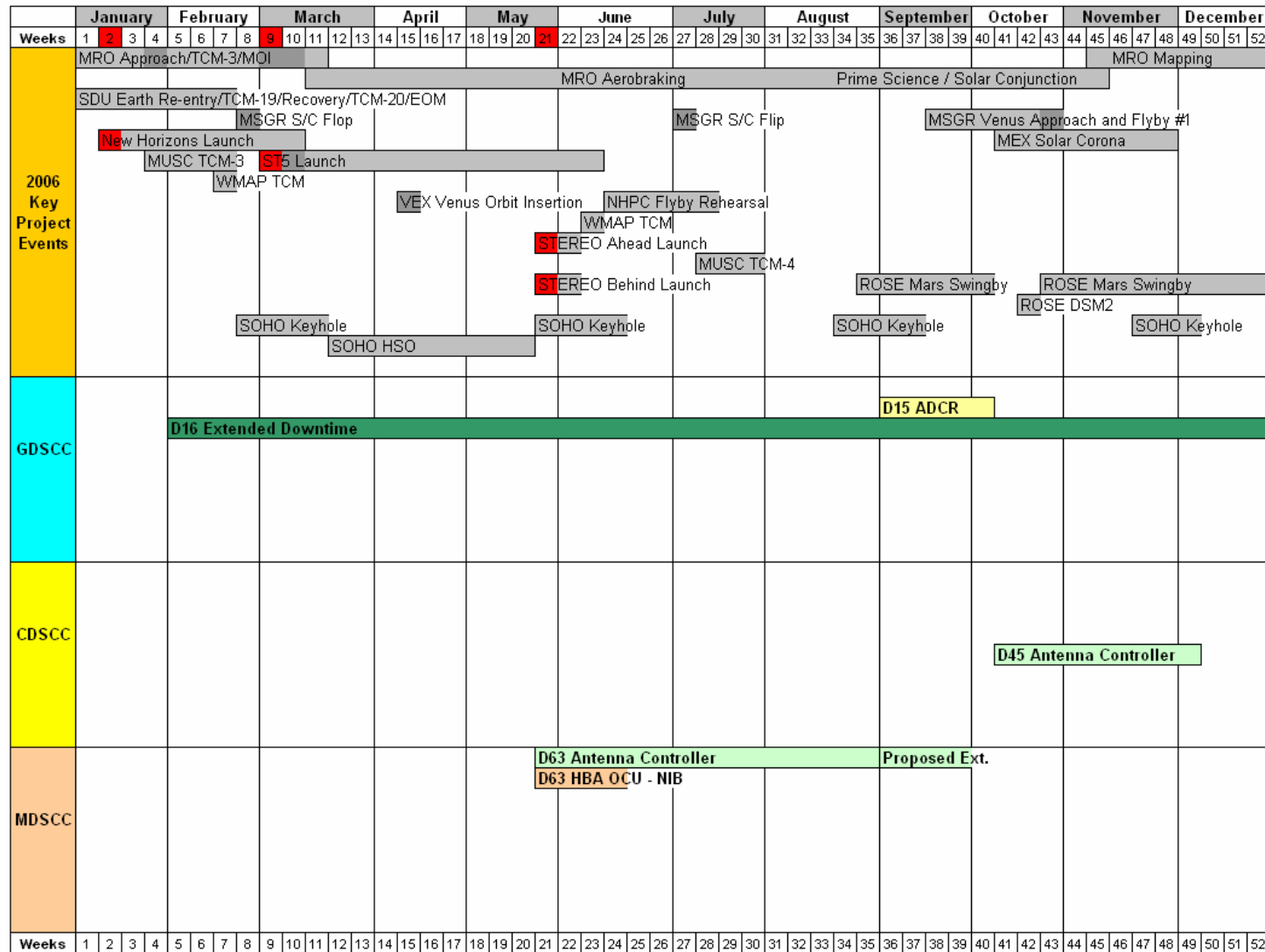


Figure 4: DSN Major Events and downtimes for 2007

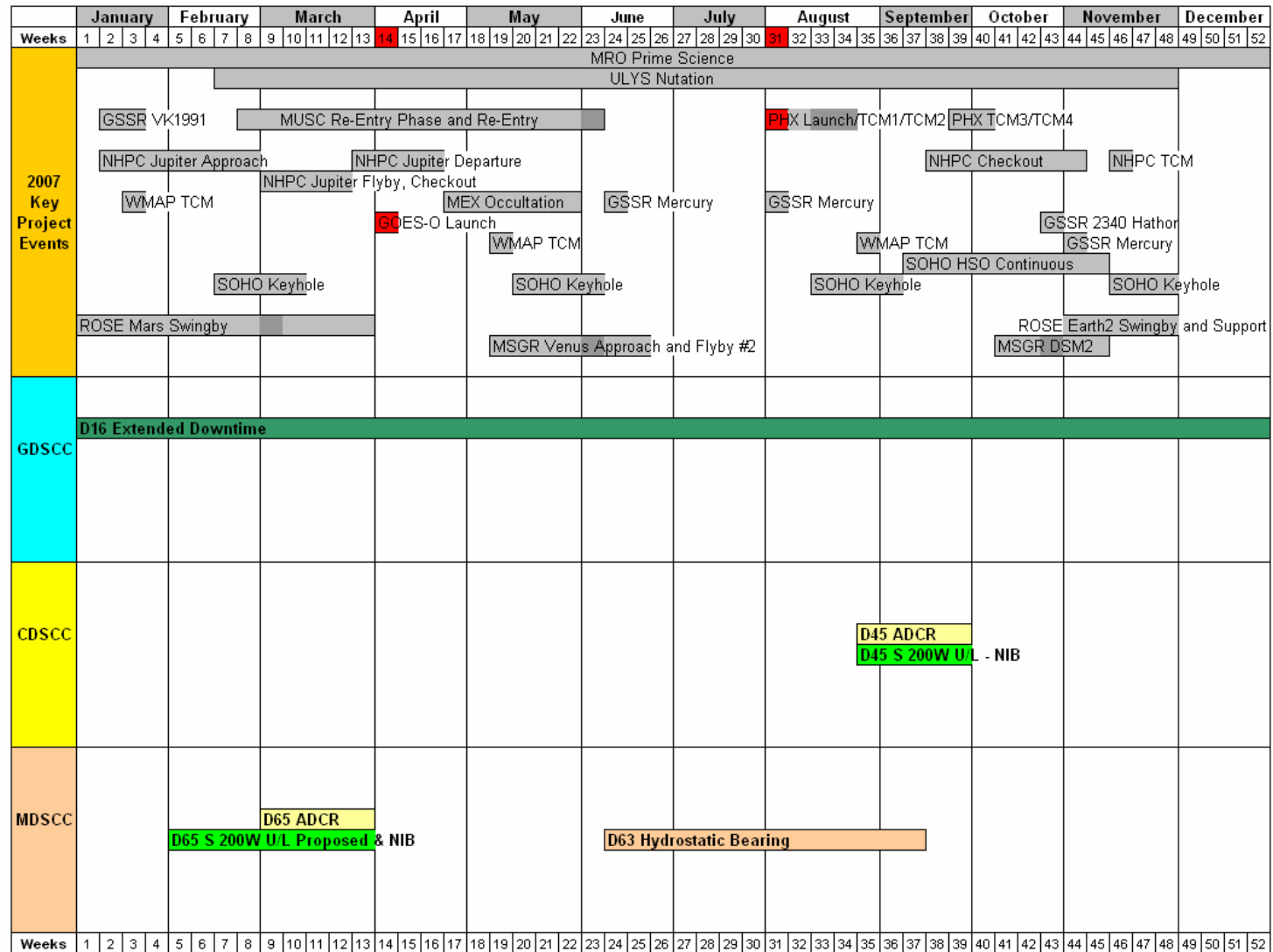


Figure 5: DSN Major Events and downtimes for 2008

